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THE SURGICAL TREATMENT OF EPILEPSY.[1]

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In the following report we record our joint experiences in the surgical treatment of epilepsy. We have attempted, in an unbiased fashion, to study the effects of various surgical procedures upon the course of epilepsy, and in recording all cases that we have operated upon, no matter what the result, we are more apt to give a correct view of how much or how little surgery can accomplish in this special field than those can give who describe their short-lived successes and do not report the many dismal failures.

The cases operated upon were selected with considerable care. They were either cases of distinctly traumatic origin or in which a strictly localized convulsion pointed to a limited focus of disease. Cases of general epilepsy of non-traumatic origin were not subjected to operation.

The following table[2] gives a succinct account of the chief points of interest in ten cases; seven of these may be designated as cases of traumatic epilepsy, one was due to ear disease, one was a case of infantile cerebral hemiplegia with epilepsy, and one was a case of non-traumatic localized epilepsy due to early acute brain disease—a case of infantile cerebral palsy without palsy, but with epilepsy.

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[1] Read at the American Neurological Association, June, 1892.

[2] We are indebted to Dr. E. Sternberger, house surgeon at Mt. Sinai Hospital, for his assistance in keeping and furnishing the records of most of these cases.

No.	Name.	Sex and age.	History of case.	Date of operation.	Character of operation.	Occurrences after operation.	General result.
I.	L. C.	M. 6	Said to have had brain fever at age of 10 mos.; at age of 5½ years first right-side convulsion, repeated at interval of one week; right hemiparesis since first attack; athetoid and associated movements.	Dec. 29, 1890	Exposure by chiselling . of motor area of right arm, determined by faradization. Dura tense and adherent; puncture; no cyst found.	Recovery excellent; no convulsions up to Feb. 2, 1891, when boy was discharged from hospital.	Immediate diminution of attacks; after leaving hospital had one mild attack; not heard from since.
II.	W.C.H.	M. 20	At age of 12 years was pushed back over pole of a wagon; supposed to have struck back of head (?); unconscious for a few minutes, but worked as usual; one week later general epileptic convulsions; has petit mal, and above all Jacksonian epilepsy involving muscles around right half of mouth. Occasionally eyes are involved. No loss of consciousness with majority of attacks.	Feb. 13, 1891	Exposed centre for representation of angle of mouth according to Horsley; adhesions under the button of bone; small cysts on dura; on puncture a little bloody fluid. Faradization over dura caused contraction only of r. angle of mouth. Large opening; button not replaced.	Attacks returned after operation and have not been diminished, and eyes are more frequently involved.	No improvement.
III.	M. K.	M. 16	At age of 18 months fell out of window; since that time epileptic attacks at varying intervals; has had tremendous doses of bromides; ill-tempered and stupid; stopped bromides; no attacks for three weeks, then left-sided convulsions becoming general.	Feb. 23, 1891	Large trephine opening over motor area for arm and leg, right side of skull.	Good recovery, but no cessation of attacks	No improvement.
IV.	E.L.M.	M. 30	Traumatic injury to right side of head; general epileptic attacks.	July 24, 1892	Trephining over occipital depression; adhesions over the depression.	Did very well except that he developed delusions of persecution.	Attacks returned within 2 weeks; alcoholic excesses.
V.	J. D.	M. 8	Traumatism at 7 months; 6 months previous to operation began to develop auditory and olfactory auræ and then general epileptic spells; if ear ceased discharging spells became worse.	1st oper. Aug. 14, 1891 2d oper. Nov. 17, 1891	Opening of mastoid and removing two sequestra of bone. Mastoid opened again and silver canula to secure permanent drainage.	Facial palsy of left side. Sept. 10th first attack; repeated attacks Nov. 18th, convulsion of right side, but none since; last report August 15, 1892.	Great improvement after second operation; no spells up to date.
VI.	T. C.	M. 26	At age of 11½ years was severely kicked by a man over the right side of occiput; 6 months later epileptic attacks which have continued nocturnally about every 6 weeks since. No hemianopsia. Marked depression in skull; was for 8 weeks without any attack; attacks then returned.	Nov. 20, 1891	Trephining and chiselling over scar; tremendous exostosis almost doubling underlying part of brain.	Nov 22, short spells; none while in hospital; discharged Dec. 15; has gone out West; has attacks every six weeks, but milder; reports that his memory is better.	Some improvement in severity of attacks eight months after operation.

No.	Name.	Sex and age.	History of case.	Date of operation.	Character of operation.	Occurrences after operation.	General result.
VII.	H. L.	M. 24	Six years ago fell down; thinks he struck on right side of occiput; one year later first attack, right hand and leg convulsed. At first had attacks six times daily, lately three or four times in two weeks.	Jan. 29, 1892	Motor arm centre on left side exposed; part of dura but no cortical tissue removed.		
				2d oper. Mar. 8, 1892	Removed arm centre as determined by electrical tests, with slight resulting paresis.	Repeated attacks after both operations.	No improvement worth mentioning.
VIII.	C. D.	F. 9	Fell out of bed at six months, striking head against bare floor; at ten months a tedious illness, slow in development; at age of 5 years began to have innumerable convulsions (at least 50 per day). Idiocy. Parents insisting on operation.	Feb. 15, 1892	Large trephine opening over left side of head (motor area).	Attacks not quite so frequent as before.	Slight improvement.
.	K. A.	M. 9	At age of 5 years had a "congestive chill" and spasms; no paralysis at the time; two or three years later developed Jacksonian epilepsy beginning in left hand without loss of consciousness; no evidence of palsy; boy feels left hand drawn up in cramp.	April 12, 1892	Excision of hand centre in right hemisphere; removed considerable tissue; hand was paretic for a few days.	Did very well in hospital for six weeks, but as soon as he left hospital and ran about got severe attack with loss of consciousness and involuntary passage of urine.	Some immediate improvement, but no lasting benefit from operation; in later attacks right arm was also involved.
X.	E. S.	M. 12	Two years ago was run over; fell backward, striking curbstone; unconscious for ten days, and had convulsions during this time; one year later convulsions became regular and frequent. Scar in left occipital region near median line.	May 27, 1892	Trephining and chiselling over occipital region.	Report not yet made.	

REMARKS, BY DR. SACHS.

I wish, first, to have a word to say regarding the determination of the brain areas to be operated upon. Working upon the rules laid down by Reed, Thane, and others, we have been accustomed to map out upon the skull with the greatest care, in advance of the operation, the exact site of the various divisions of the motor areas. Excellent as this practice is, I am now firmly of the opinion that in most cases it is quite unnecessary, and that the application of the faradic current to the dura will help us to localize centres much more carefully than any of the customary rules will.

At the last meeting of this Association doubt was expressed whether faradization of the dura was apt to be successful.[1] My experiences during the past year have helped to strengthen the opinion expressed at that time, and I feel so certain of the absolute reliability of this procedure, that I would be willing to have the skull opened at any reasonable point over the motor areas and by means of the faradic tests determine the exact location of the centres. I have demonstrated this again and again to the satisfaction of Dr. Gerster and a large number of medical men present at these operations. The method is furthermore so accurate that I believe we shall be able to determine the exact subdivisions of the motor area in the brain of man as they were determined by the physiologists upon the brains of the monkey and other animals. The success of this method was particularly marked in Case II., a case of Jacksonian epilepsy with convulsive movements of the muscles about the right angle of the mouth. In Horsley's article I found an area which he claims to contain the representation of the upper face and angle of the mouth. I located this area as closely as possible upon the skull, and after trephining, on applying the faradic current to the dura, caused contraction of those muscles and of those muscles only which were, as a rule, involved in the epileptic convulsion. I need not add that the same tests applied to the cortex will give equally satisfactory results; but the chief advantage of determining these areas before opening the dura is that we may be sure that we are right before exposing any large part of the brain cortex.

While I am very certain that this method will be found entirely satisfactory in all cases of ordinary brain lesions, I have a suspicion that in cases of tumor,[2] or in cases in which the brain tissue has been seriously altered by disease, the morbid brain tissue may not respond as promptly to the current. In such cases the older method of determining the areas will have to be resorted to.

The first and most notable result of the operations we have recorded is that we cannot claim a single decided cure. In several of the cases there has been a marked diminution of the attacks immediately after the operation; in some the improvement lasted for a few months; but in every single case the attacks recurred after a lapse of several months or even less. The case which promises best is Case V., in which the epilepsy—characterized, by the way, by interesting auditory and olfactory auræ—was due to ear disease, and in this case the improvement that has set in has now continued nine months; but a second operation was necessary to bring about this result. The quiet of hospital life after an operation, and the unusual care which patients receive during this time, undoubtedly contribute to the cessation of attacks, and may in some way account for the successes so frequently reported, as was illustrated in Case IX. Not a single attack occurred for six weeks after operation, but as soon as the boy was dismissed from the hospital and allowed to roam about at his own free will, the attacks returned and possibly even with greater force than before.

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[1] At the meeting of this year the same doubts were still entertained by some Philadelphia colleagues. We can do no more than ask them to try and see for themselves.

[2] Since writing the above, the "electrical method" proved to be thoroughly satisfactory in a case of cystic tumor of the motor area.

In the first six cases reported, the operation consisted simply in opening the skull, possibly the dura also, without excision of cortical tissue. In Cases VII. and IX. cortical tissue was removed; but as far as our experience goes, excision of cortical tissue or excision of a diseased area is not superior to the older method of simple trephining. In these very cases of traumatic epilepsy it is not always an easy matter to excise the area which is supposed to be the starting-point of the epileptic disease. If the motor area happens to be the part injured, this can of course be attempted; but if, as in two of our cases, the traumatic injury caused a depression over the occipital areas, excision of the cortex, with its probably resulting disturbances of vision, would not be advisable or even fair to the patient.

If we seek for some special reason why operative procedure has accomplished so little in these cases, it is to be found in the fact that they came under our notice after the epilepsy had been established for many years. It is now generally conceded, as I pointed out in a former paper,[1] that, though a focus of disease is the actual cause of the epilepsy, this epilepsy does not manifest itself, as a rule, until widespread changes have appeared throughout the entire brain.

The time that elapses between the infliction of the initial lesion and the development of these secondary changes corresponds quite accurately with the period of time between the traumatic injury or the initial disease and the development of epilepsy.

If we operate upon cases which have run a course of many years, removal of the initial focus of disease will have little effect upon the general sclerosis that has been established. It is this general sclerosis that keeps up, as it were, the epileptic habit. The inference to be drawn from this is, that we should remove the focus of disease before secondary changes have been set up. This is equivalent to asking prompt surgical interference in all cases of traumatic injury to the skull in which there is any reason to suppose that serious harm has been done to the brain, and also in those cases in which the occurrence of a localized hemorrhage of non-traumatic origin is more than likely to give rise to epilepsy later on. The operations themselves, if skilfully done, are borne so well by persons above the age of five years that a more energetic surgical treatment in the earlier stages of these troubles will be productive of great good in the way of preventing the development of epilepsy. I have not yet got beyond the point of believing that the only way to cure epilepsy is to prevent its development.

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[1] Sachs: "What Can We Expect from the Surgical Treatment of Epilepsy?" N. Y. Med. Journ., February, 1892.

The old method of trephining for traumatic epilepsy has been so frequently recorded as productive of good that we must endeavor to find some explanation for the effects of this procedure. It will not do to classify it simply, as Dr. White does, as one of those cases in which the operation *per se* helps; I am inclined rather to believe that the frequent occurrence of cysts in traumatic cases, and also in cases of old cortical hemorrhages, accounts for the improvement following upon the release of pressure over a cystic area. The excision of cortical tissue which has been considered the only rational method in the treatment of epilepsy since Horsley first recommended it, seems to me, after all, to be of questionable merit. If the disease involved the motor area, excision of the part is apt to be followed by paralysis. This most patients are willing to bear, provided they can be promised a freedom from future attacks. In all but the most acute cases such promise can scarcely be given. Moreover, if the injury happened to involve other than motor areas, particularly if it involved the occipital or even the frontal portions of the brain, excision of any considerable cortical tissue would be in the nature of a rather dangerous experiment, inasmuch as the resulting loss of function could not well be foretold. Taking this in connection with the fact that the excision of tissue does not seem rational after the development of a general sclerosis, or gliosis as Chaslin would have it, it is evident that this "rational method" is applicable to only very few cases.

It is our iutention to continue this series of operations in the hope of being able to determine those cases in which the operations promise good results. For the present I am bound to acknowledge that the prospects are rather gloomy, and that the successful cases will probably be those in which there is some very tangible organic lesion which has been removed at a very early period, or those cases in which, after traumatic injury to the skull, trephining has been done before the effect of depression of the skull upon the brain has resulted in the development of epilepsy. Considering the seriousness of epileptic disease and the slight danger attending the opening of the skull, I believe it to be the surgeon's duty, in every case in which there is the shadow of a doubt about the effect of a traumatic injury to the skull or brain, to trephine the skull and thus remove the cause of an epilepsy that would be apt to be developed.